

REMARKS/ARGUMENTS

STATUS OF THE CLAIMS

Original claims: None

Currently amended claims: 6, 7, 8, 12 and 17

Previously presented claims: 13, 14 and 15

Canceled claims: 1-5, 9-11 and 16

Claim Rejection – 35 USC §103

The examiner has rejected claims 17, 6, 7 and 15 under 35 U.S.C. 103(a) as being unpatentable over Poncelet et al. (US 5,888,711) in view of view of Yasuhiro et al. (JP2001-104711) and further in view of Hasegawa et al. (US 4,923,629).

The examiner has rejected claims 8 and 12-14 under 35 U.S.C. 103(a) as being unpatentable over Poncelet et al. (US 5,888,711) in view of view of Yasuhiro et al. (JP2001-104711).

The applicant respectfully disagrees with the examiner, specifically because the present application, as now amended, provides the method of production of “liquid” flocculent and coagulant mainly consisted of mono-silica complex (salt) which is “ionized” in the liquid and “effectively” catches organic and non-organic chemicals in waste water. The “ionized” mono-silica salt complex can catch not only dissolved chemicals in waste water but also solid suspension more effectively than poly-silica or solid silica particles. It is the process of how to make the mono-silica complex (salt) in the liquid flocculent and coagulant is the novelty of the present application.

Currently amended claim 8 now describes the important pretreatment of alkaline (calcium carbonate or lime) by heat treating at a temperature lower than the melting temperature, by which silica-contained substance become powder that is released from chemical bonding of multi-silica molecules and turns to single-silica molecule.

The Silica containing substance becomes Mono-Silica after heat-treatment as is described in claim 8. Natural Silicate Ore, such as Quartz($Al_xSi_yO_{2(x+y)}$) and Cray($Si_{2n}O_{5n}$), is crystallized basically with Silicon atoms through Oxygen Atoms as is illustrated below as net in 3-dimension:



Where the Gray color ball represents Silica and Red colored ball represents Oxygen.

By heat treatment below its melting temperature, the connection through Oxygen is released and the network connected silicate-ore turns to a simpler chemical structure as is illustrated below:



further to



Where the Gray color ball represents Silicon Atom and red colored ball represents oxygen. In many cases after the heat-treatment, the crystallized silicate becomes the form of lumps of powder which are fragile and easy to break into powder.

This single structure of Silica, Mono-Silica, is easier to dissolve in Acid especially Hydrochloride (HCl). The original claims of the application did not use the wording of "Mon-Silica" in the description, but used the wording Mon-Silica in the response to the final office action to more clearly identify the Applicants' intention and to explain the difference between heat-treated Silica containing substances and non-treated ones.

Water-Glass is a poli-Silica substance with $\text{NaO}_2\text{-n}(\text{SiO}_2)$ which is a polymerized Silica compound in water. Thus the water-glass is viscous and does not easily dissolve in acid. Even when Silica Salt is being dissolved in acid, the Silica Salt becomes gelation and hard to use as flocculent.

Acidic solvent (HCl) can dissolve the powdered mono-silica more easily than the other form of silica. The amount of ionized Silica in the flocculent solution characterizes its performance. Furthermore, the alkaline such as Calcium Carbonate or Lime contains Calcium in dissolved condition by acid (HCl) also enhances the performance of the present application as flocculent.

Solid silica particle (or calcium carbonate) catches solid suspension in waste water so far but not effectively and does not catch enough dissolved chemicals.

Poly-silica flocculent made from water-glass tends to gelate by itself in the flocculent solution in a few days and also needs assistance of Ferrous ions to flocculate effectively in waste water. Silica made from water-glass and dissolved in acidic becomes gelation in hundreds hours, and once the flocculent becomes gel form, it is not easy to disperse the gel form into wastewater.

The liquid Mono-Silica base flocculent as disclosed in the pending application is added with Acetic Acid which prevent forming of gelation after more than one year. The original claims did not exclude water-glass as Silicon-containing substance but water-glass shall be heat-treated to reform into Mono-Silica. The heat treatment is one of the core technology of the present application.

The major difference between the present application and the cited references which were referred to by the Office is:

- (1) In US 5,888,711 by Poncelet et al.: The application is a mixed material of aluminum-silicate alkoxide or aluminum-silicon precursor (such as water-glass: Na₂SiO₃·5H₂O) by means of an alkali in aqueous or hydroalcoholic solution. The starting chemical composite of silicate is a liquid but not the heat-treated powdered silica by the present application. The aluminum-silicate precursor is shown as Al_xSi_yO_z which is a poly-silica compound and not the mono-silica compound by the present application. In the Example 4 of the invention of Poncelet et al., it describes the re-dissolving of aluminum-Silicate Precursor into HCl + CH₃COOH (acetic acid) for re-polymerization of Aluminum-Silicate compound to spread into layer for anti-static layer. This is not performed for the same purpose as flocculent of the present application. The invention of US 5,888,711 does not describe the effect of CH₃COOH for maintaining Silicate being dissolve in the HCl solution. The present application discloses that the HCl-dissolved Silicate is maintained from being dissolved with acetic acid or ammonium acetate or ammonium chloride as gelation-suppressant for long term storage (more than 3 -12 months) compared with the use of Silicate solution only with HCl.
- (2) In US 4,923,629 by Hasegawa et al., the invention is related to the flocculent made from water-soluble poly-silica (Water-Glass) further reacted with Sulfuric Acid for higher polymerization. The flocculation property by poly-silicate is good, however, the gellation by itself is also strong and dispersing the gellation itself in wastewater is not good because of its viscosity. A storage period of longer than 100 hours make the solution gel, which renders it useless for flocculent.
- (3) In JP2001-104711 by Yasuhiro et al., the application is related to a flocculent made from the intermediate of cement product. The flocculent is not liquid but

is powder (solid) which is troublesome for a water-suspension process thereby rendering it difficult to use with wastewater. The flocculation effect is much less than the liquid silicate flocculent by the present application. The cement intermediate product is certainly one of the Mono-Silica contained substances of the present application, however, the product is a solid/powder and it is not easy to handle as flocculent, especially to disperse into wastewater. Compared with the liquid silica flocculent, the chemical reaction of powder which is not water-soluble is slower and rarer. Being dissolved in Acid to form a liquid flocculent is obviously the major difference from Yasuhiro's invention.

The examiner seems to be using hindsight construction to form the rejection without taking the cited references as a whole. In *In re Rouffet*, 47 USPQ2d 1453 (Fed. Cir. 1998), the court states "*Where a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references.* See *In re Geiger*, 2 USPQ2d 1276 (Fed. Cir. 1987~ (at p 1456).

(At page 1458) "*To prevent the use of hindsight based on the invention to defeat patentability of the invention, this court requires the examiner to show a motivation to combine the references that create the case of obviousness. in other words, the examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed.*"..."

...Rather just as it (sic the Board) relied on the high level of skill in the art to overcome the differences between the claimed invention and the selected elements in the references, it relied upon the high level of skill in the art to provide the necessary motivation...If such a rote invocation could suffice to supply a motivation to combine, the more sophisticated scientific fields would rarely, if ever, experience a patentable technical advance"..." To counter the potential weakness in the obviousness construct, the suggestion to combine requirement stands as a critical safeguard against hindsight analysis and rote application of the legal test for obviousness."

*... “Because the Board did not explain the specific understanding or principle within the knowledge of a skilled artisan that would motivate one with no knowledge of Rouffet’s invention to make the combination, This court infers that the examiner selected these references with the assistance of hindsight. This court forbids the use of hindsight in the selection of references that comprise the case of obviousness. See In re Gorman, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991). Lacking a motivation to combine references, the Board did not show a proper *prima facie* case of obviousness.”*

The modified claims in this response is a combination of several public domains individually, however, there is no similar product as the present application which combined all these elements into more useful form of flocculent with the following features:

- 1) Silica base flocculent which is environmentally friendly compared with Aluminum base flocculent or Polyamine High Molecular Flocculent
- 2) Liquid form in order to use easily and quick reaction of flocculation
(Silica contained substance is heat treated to in order to reform it for easy dissolving into acid)
- 3) Long term storage possible as a form of liquid flocculent (with Acetic Acid addition)

The applicant has made amendments and arguments to independent claims 8 and 17 that makes them novel from the cited reference. Dependent claims 6, 7, and 12-15 are novel based upon dependency on independent claims 8 and 17. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,
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